

Automation Study

Highlights



Engineering and
Machinery Alliance

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Executive Summary

Manufacturing is a vital contributor to the UK economy and provides over half of the country's exports. Based on sustainable businesses, the growth of the UK's manufacturing base is key to rebalancing the economy and generating exports and future prosperity for the country.

In a relatively high cost economy such as the UK, the application of automation (industrial robots or electro-mechanical devices under the control of microprocessors performing handling or processing functions) is an essential ingredient in the sustainability of manufacturing businesses enabling them to compete more successfully in the global market. Automating manufacturing processes not only drives costs down, it improves quality, reduces waste and optimises energy use.

Industry statistics, confirmed by this report (*Application of Automation in UK Manufacturing 27th Sept 2010* (ref www.eama.info)), show that UK manufacturing has fallen behind our European competitors in this area. Taking robot use as an example, Germany has an installed base of 144,800 industrial robots and Spain 28,600, whereas the UK records only 15,100.

By comparing UK manufacturing companies with similar businesses in Germany, Spain and Sweden this study, which focused particularly on small and medium sized companies (SMEs), identified three main barriers to the use of automation in the UK compared to the other countries.

Awareness:

UK SMEs are not suitably aware of what can be and has been automated successfully elsewhere, or of the costs and the associated overwhelming benefits.

Risks:

In many instances SMEs don't have the confidence, due to lack of experience and technical expertise, to risk changing existing manufacturing systems and there is little support to minimise these risks.

Financing projects in the UK is also more challenging as payback expectations are shorter – typically less than two years when the plant will run for a minimum of five years and can provide a useful life in excess of ten years.

Skills:

The government's growth strategy (A strategy for sustainable growth, BIS July 2010) has recognised that UK manufacturing generally lacks engineering skills, to apply automation systems, at apprentice, technician and engineer level. There aren't enough

UK colleges and universities developing the skills that modern manufacturing operations and automation require.

Recommendations

In order to address these barriers the report makes the following recommendations:

1. Automation Council

First, to ensure a strategic approach we recommend the formation of the Automation Council. Its purpose will be to provide long term, high profile leadership, as a focal point:

- Stimulating manufacturing and R&D investment in automation.
- Furthering successful cross sector fertilisation
- Supporting government departments and bodies (including BIS, Defra, TSB, EPSRC) providing advice and assistance.

Second, the Council will start to address the specific barriers identified in the study, namely:

2. Awareness:

To initiate a promotional programme based on success stories from UK SMEs and highlighting the benefits they have gained from their automation investment programmes.

3. Risk:

To be addressed with three initiatives:

- A resource of impartial and expert advice to be provided.
- Automation vendors to be encouraged to strengthen their supply chains and provide enhanced support to their end customers.
- Clearer signposting to and information about all forms of support including any relevant Government services.

4. Skills:

As a first step two initiatives to be developed:

- First, to foster collaboration between universities and SMEs using the Swedish Robotdalen initiative as a model.
- Second, to utilise the excitement and interest generated by robotics as a vehicle to encourage greater participation in STEM subjects at all levels in education.

The formation of an active and influential Automation Council coupled with these initiatives is recommended as the best way to tackle the decline in UK manufacturing competitiveness and build manufacturing to become a stronger and larger contributor to the UK economy.

1. Introduction

The Engineering and Machinery Alliance (EAMA) and its partners commissioned this study to determine why 'UK Manufacturing' normally invests far less in automated manufacturing plant than its European counterparts, what that means for UK manufacturing competitiveness and what might usefully be done to rectify the situation.

This document summarises some of the study's results. More detail can be found in the full report, *Application of Automation in UK Manufacturing 27th Sept 2010* (ref www.eama.info), which also includes case studies showing the significant benefits that automation brings. This is a critical issue for 'UK Manufacturing' as it is well recognised that automation is essential, in a relatively high cost economy, if business is to be retained in the longer term. Germany, Korea and more especially Japan are testament to this.

Besides the obvious increases in productivity, automation can also improve quality and health & safety performance and reduce waste and environmental impact more generally. Automation enhances competitiveness and thus enables manufacturing businesses of all sizes to be more successful on the international market. It is also enlightening that Chinese and Indian companies, despite their lower cost of labour, are significantly increasing their investment in automation.

The EAMA study focused on two sectors, engineered products and food manufacturing as these are both important UK manufacturing sectors. The study benchmarked these activities against three other countries, Germany, Spain and Sweden, to provide a good representation of the situation across our main competitors in the European Union.

The study is based on an economic analysis and interviews with companies across the sectors and countries studied. The majority of the respondents are SMEs, most with some knowledge of automation.

EAMA commissioned the study from Metra Martech Ltd, an independent market research consultancy on behalf of the sponsors: Department for Business Innovation and Skills, East Midlands Development Agency (the lead RDA for Manufacturing), North West Development Agency, ABB Robotics, KUKA Automation + Robotics and the Centre for Food Robotics and Automation with support from the British Automation and Robot Association.

2. Case for Automation

In today's highly competitive world markets the industrialising economies are growing fast to meet their own market demand. At the same time they are pulling manufacturing away from the traditional manufacturing countries in Europe and America. The UK is the world's 6th largest manufacturer but its industry has come under increasing pressure not only from lower cost competitors, but also from competitors in the developed world that have invested more in their manufacturing sectors' productive capacity to sharpen their competitiveness.

A vibrant manufacturing sector has the potential to grow a nation's GDP and increase its gross value added to the benefit of all citizens, not just those working in the sector. To succeed on world markets, manufacturers have to build product and process competitiveness through their technological strengths. They achieve this by investing in manufacturing systems, the benefits of which more than offset the four or five to one labour cost advantage typically held by the lower cost economies. Automated systems deliver these benefits and therefore enable UK manufacturing to compete successfully overseas.

2.1 Benefits of Automation

Automation delivers a whole series of benefits. However it needs to be fully integrated into the overall manufacturing and production business strategy for these to be realised.

Full automation is not appropriate in all instances and not all benefits apply to all situations. Nonetheless appropriate and well applied automation will bring multiple gains.

Improved Productivity

- Reduces the unit manufacturing cost by producing more while using less.
- Increases the yield produced for a given resource input by ensuring consistency of process and quality.
- Automation removes the need for humans in the more mundane and repetitive tasks in manufacturing – freeing them to work on other tasks where their decision making skills and flexibility will provide a better return against their costs.
- The flexibility of automation allows for quick changeovers leading to smaller batch sizes and reduced stock and work in progress.

Improving productivity enhances competitiveness and opens up opportunities to win more work both in the UK and overseas leading to business growth, greater profitability and increased employment.

Improved Customer Response and Service

- The flexibility of automation makes it fairly easy to increase and decrease output as demand fluctuates, for example, by running lights-out shifts or during weekends for limited additional cost.
- Automation can speed up switchover between products allowing shorter runs and quicker, more frequent deliveries which ultimately results in better customer service.
- The matchless consistency of automation ensures the appropriate quality is maintained whatever the length of the production run.

Improved Quality

- Automation doesn't tire during the day, doesn't lose concentration and doesn't make mistakes.
- Automated processes result in less material waste and less rework, both improving the yield.

The repeatability and consistency of automation allows you to control processes, through tighter tolerances, keeping product quality levels high and costs minimised.

Improved Employee Satisfaction & Performance

- Automated systems can replace humans in hazardous areas and dangerous operations.
- Highly repetitive tasks, where a lapse in concentration affects costs and quality, can be automated leaving the more skilled activities to humans and improving their job satisfaction at the same time.
- Some processes require skills which can be difficult to find and retain, particularly as the workforce ages. Automation can be utilised as an alternative, particularly for the more repetitive tasks.
- Automation can replace the lower cost, largely eastern European, labour pool as the workers return home and the availability of this resource declines.

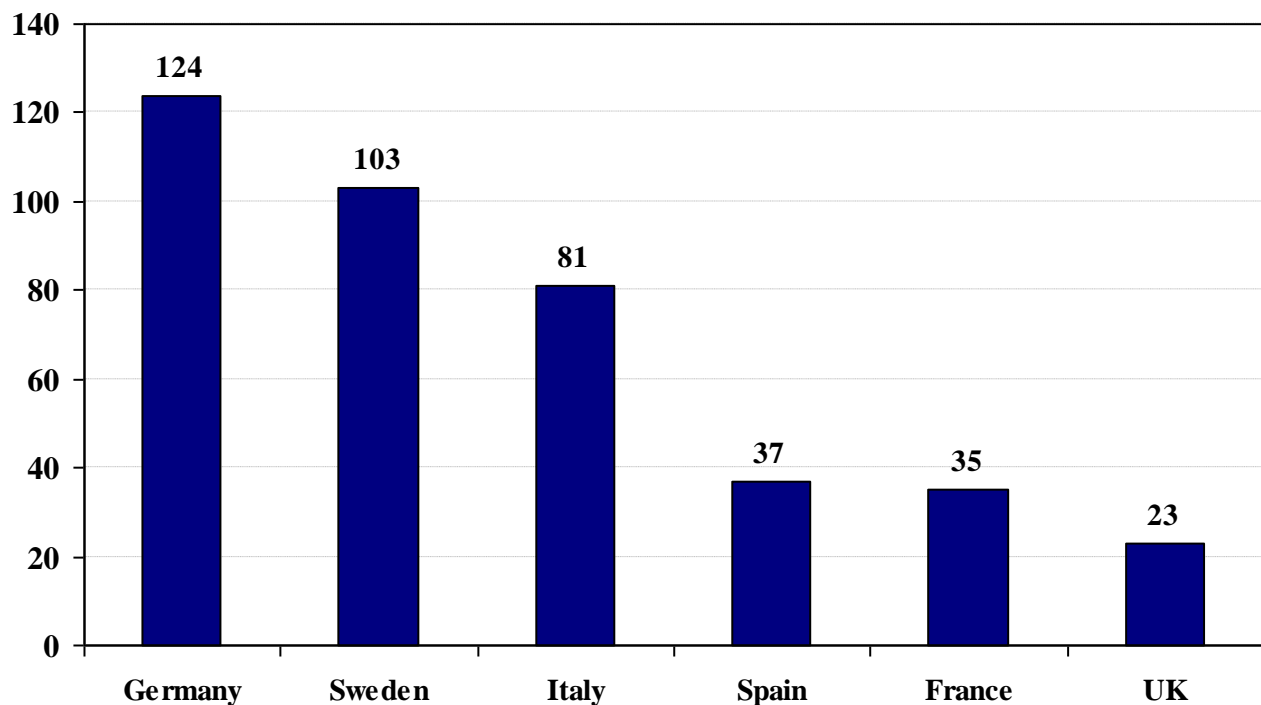
Often automation is seen as removing jobs. However, it has been proven, many times, that automation actually improves the satisfaction and performance of those working in the company and ultimately protects jobs.

Supports Environmental Agenda

- Automation can operate in harsh conditions and at greater extremes of temperature than humans reducing the need to condition environments to the same degree and saving on energy costs.
- Automation can operate in a smaller space. Reducing the amount of room required provides more compact facilities or produces more output from existing resources and removes the need to expand.
- Automation reduces scrap and rework and improves yield, consequently reducing energy bills.

2.2 Where are we Today?

Robots are only one part of automation, but they provide a measurable indication of levels of automation, and one that is reported internationally. For example, the data for robot density (number of robots in use per 10,000 persons employed), for all manufacturing sectors excluding automotive, illustrates the poor position of the UK, at 19% of Germany and only 62% of Spain.



Robot density - International Federation of Robotics "World Robotics" 2009

This lack of investment is confirmed by the actual numbers in the same report.

	Industrial Robot Population [2008]	Robots in non Automotive applications
Germany	144,800	67,000
Spain	28,600	11,440
UK	15,100	6,000
Sweden	9,400	6,400

2.3 Level of Automation in UK

The project was based on an analysis of industry statistics backed up by interviews with SMEs. The interview sample consisted principally of automation users and therefore almost every company had some automation within one activity of its operations. The statistics show the lack of UK investment in automation and the interviews demonstrate that even where there is automation, it tends to be less widely used in the UK companies as compared to those in the other countries.

Although it is not included within the study, the automotive sector is worth a comment, as it has such an important role, as the leading user of robots. Due to the internationalisation of the automotive sector, UK automotive is now dominated by overseas companies who often develop their manufacturing technologies, plant and equipment in their base country rather than the UK.

As a result the majority of the larger suppliers of automated equipment in the UK are subsidiaries of overseas parents rather than centres of innovation in their own right. The UK owned businesses are often relatively small. Therefore there is less strength in the UK supply chain from which to promote and sell automation across all the other sectors, including food and precision engineered components.

2.4 Job Creation

Automation is often seen as a threat to jobs when in fact it is quite the reverse. In addition to the high technology jobs that are required to implement and maintain automation systems, competitive, profitable businesses grow and expand their workforce across all functions. While it may be true that certain positions will likely be

displaced by automation, on the other hand, automating enhances job functions and ultimately supports sustainable, long term employment.

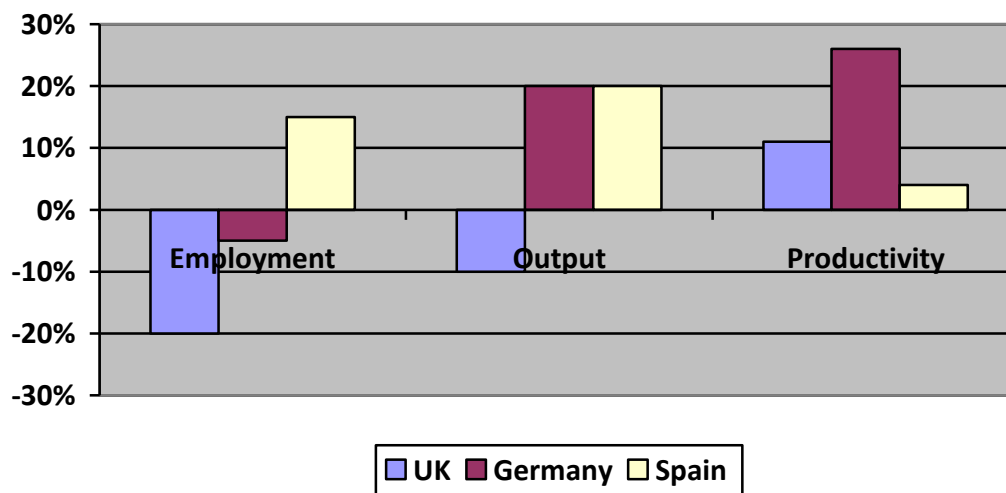
A number of companies within the study specifically stress that automation has enabled them to increase production, allowing the re-deployment and re-skilling of the displaced labour (see case studies in full report). The higher level of automation and the smaller reduction in the engineering work force in Germany over the past eight years reinforces this point.

The most active companies appear to be automating to meet demand rather than to survive, and there is considerable attention to retraining, redeploying staff rather than redundancy. Most of the companies say that a good proportion of those who could be displaced, are of a standard that they can be retrained. The workforce often recognizes the need for businesses to remain competitive even at the expense of some jobs.

Many UK industries, in particular the more traditional sectors such as engineering and food, face the problem of an ageing work force and the difficulties of attracting new, younger employees. The increased use of automation does provide a solution.

3. Differences between UK and other Countries

The German engineering sector is more than twice as large as its UK counterpart and has a greater number of larger companies. In Spain, the average number of employees per company, in both food and engineered products, is much smaller than for the other three countries. In contrast to engineering, the UK food industry is made up of some very large companies and has significantly fewer small companies than the other three countries.



Engineered Products Sector Changes 2000 to 2008

Significant changes have taken place in the engineered products sector, in the eight years up to 2008. As can be seen above the German productivity increase of more than twice that achieved in UK, enabled German industry to grow output and to keep many more people employed as a result.

In the food industry, over the same period, the numbers employed have declined in the UK and Sweden [18% and 22% respectively] while output has increased by 15% in both countries. Both employment and production has increased in the food industries of Germany and Spain. In the UK and Sweden companies tend to be larger than in Germany and Spain. Although productivity increases in the UK and Sweden have been as much as 30% in the larger companies, the SMEs in the UK have fallen behind.

3.1 International Competition

When asked how advanced they were, UK companies tended to think they were advanced compared with others in their country, but where they could comment, they rated the Germans as being more advanced.

The German companies tend to believe they are at a similar level to others in their sector in Germany, but more advanced than competitors in the other countries. A number of Swedish companies rated the Germans as being more advanced. The Spanish companies interviewed rated themselves highly in Spain and also as compared with competitors in the other countries, including Germany.

Competition from the low cost countries was identified as a problem by the UK engineered products sector but the interviews showed this to be less of a problem for the manufacturers in the other countries. It was not currently seen to be a problem for the food industry in any of the countries.

3.2 Attitude to Risk

The great majority of the people interviewed in all four countries said they took a similar view to business risks as those in the UK or elsewhere. Typically, some say they are leaders, but more say they let others innovate first.

The lack of automation related skills in the UK (see 3.5) may well also have an impact, as the level of risk as perceived in the UK, would be higher due to the lack of internal expertise and external support.

3.3 Funding and Financial Support

Across both sectors and all four countries the most usual source of funds was internal, reinforcing the idea that it is the successful companies that invest in automation. However, over 20% of the UK companies said that their investment had been prevented or delayed by lack of funds. This problem was not identified in the other countries.

UK government support for investment is broadly less than in the other countries as summarised in the following table. The aspects highlighted indicate those areas where the government support is better than in the UK.

Factor	UK	Germany	Spain	Sweden
The EU Incentives Framework	Broadly similar offerings			
Financial Incentives for Capital Investment	Equal to Sweden	Better than UK/Sweden	Better than UK/Sweden	Equal to UK
Innovation Research and Development Grants	Many small grants	Wider range of incentives	Much greater scope	Much greater scope
R&D Tax Relief	More for large projects	More flexible	Remarkable range	Most advanced R&D funds
Operational Incentive Packages	Difficult for SME to access?	Appears to offer more	Wide range available	Well developed

3.4 Labour Costs & Flexibility

Personnel costs in the UK engineering sector are midway between those in Germany and Spain. In the food industry the average cost per person is higher in the UK than in Germany although this is likely to be due to the much greater proportion of large companies that constitute UK food manufacturing. There is a large employment of lower cost, often immigrant, labour in Spain and the UK.

UK manufacturing companies benefit from more flexible employment and redundancy terms than the other three countries, particularly Spain.

Factor	UK	Germany	Spain	Sweden
Employment contracts and conditions	Most flexible	Less flexible	Least flexible	Less flexible
Hiring and redundancy	Most flexible by far*	Less flexible	Least flexible	Less flexible

**Note pending EC Legislation on temporary workers which becomes effective in UK in Oct 2011.*

The UK food industry reports use of temporary workers at peak/seasonal times. The response is very varied but there are cases of 50% of the unskilled workers being agency or short term staff.

We found less evidence of low cost, short term labour in the engineering sector in the UK, although there is evidence of migration of skilled EC labour to Germany and the UK.

3.5 Skills – in Engineering & Specification, and Operational Support

When it comes to the initial specification of a new automation solution, there is more dissatisfaction among UK customers. They, typically the less advanced, report that the automation supplier does not know enough about their business. In contrast, the more advanced customers are more prepared to specify exactly what they want against which the supplier can quote.

In Germany the less experienced buyers find that the automation suppliers have done what they want before, and can advise them. The more advanced buyers have more skill in preparing their specifications and generally the customers in Germany are more prepared to specify their requirements.

This indicates a problem in the interface between the automation suppliers and the manufacturer/customer in the UK. It further suggests a lack of skills within customers, lack of resources within integrators and probably a lack of specific industry knowledge at the UK offices of the main automation equipment suppliers.

4. Barriers to Investment in the UK

Driving factors for investing in automation

German and Swedish engineering companies stress cost saving, productivity, quality and consistency. UK responses from the engineering companies are less focused, suggesting less awareness of the key benefits to be gained.

An important factor in the decision to invest is also establishment of new manufacturing facilities and replacement of worn out equipment.

The case histories point to a variety of aspirational reasons for investing in automation: *expanding to meet demand, small company invests to double production, getting more capacity out of existing machinery, the investment saved many jobs, investing to compete internationally, introducing a cost effective in-house solution...*

4.1 Why does Germany automate more than UK?

Germany has the most automation because of:

- High wages, which lead to more need to reduce labour costs to remain competitive.
- Relatively strict employment legislation which makes companies cautious about the number and cost of their employees.
- Larger engineering companies, and more of them, which means that there are larger teams of skilled experienced engineers.
- Availability of skilled designers, brought about by the large size of the engineering sector.
- Automation skills migrating from other sectors, particularly from the large automotive industry.
- Availability of funding.

4.2 Spain

Spain has high activity, despite lower wages and availability of immigrant labour, because of:

- Recent fast growth, which has resulted in newly built automated plants.
- Receptive unions and active stakeholders.

- Payback flexibility, allowing less restrictive time scales in which new equipment has to pay back its cost.
- Available Government assistance.
- Limited product ranges, often set up by overseas companies.
- Less flexible employment contracts.

4.3 Sweden

The Swedish position includes medium to high personnel costs, receptive unions and involved stakeholders, with good awareness of regional support. There is good support and encouragement for the development of automation within SMEs (eg Robotdalen).

Within Sweden there is also a limited labour pool, with strict and expensive severance legislation, as well as a strong health and safety ethic within the community, supported by reasonably stringent regulations.

4.4 UK

The UK has a weaker position because of:

Lack of awareness of the potential benefits

- Less awareness of, or enthusiasm for automation.
- More emphasis on bespoke products, which the companies say do not lend themselves to automation. *Note that “bespoke” production can often benefit from the flexibility which robotic automation technology can provide.*

There is evidence from the interviews that users or potential users of automation in UK lack knowledge of automation potential and therefore cannot envisage the advantages or brief the supplier correctly (on, for example, real tolerances). This is particularly true in the food industry where there are fewer engineers on site. Nor do they know where to go to get advice. Limited impartial advice is available because it has not been a focus for the existing business support organisations such as the Manufacturing Advisory Service (MAS) and Business Link.

The interviews suggest that the SMEs interviewed recognise that they are [mostly] as automated as their UK counterparts, but less automated than their German equivalents. Increases in productivity are being achieved, but not fast enough to keep up with the increases achieved in Germany. It seems that the situation is not being treated as a priority.

Risk and funding

- Problems with obtaining funding [in some cases].
- Lack of awareness of, or ease of access to, Government assistance.
- Less involved stakeholders.

There is considerable variety in the responses, but comparison with the responses from the other countries suggests that UK companies take a more severe view on payback required from a project, typically within two years, than do the companies in Spain and Germany where 3 to 5 years is more often mentioned.

There appears a lack of skill in assessing the risk and presenting the case, both operationally and financially, for new technologies.

UK and Swedish companies are slightly more likely to use banks. Only UK companies (20%) reported that lack of funds had held up their investment in automation whereas no overseas companies said that they had been held up for lack of funds.

- Availability of low cost, flexible labour.

The significantly greater flexibility and continued availability of lower cost labour makes this an easier choice than the investment in automation. However, this is not a long term solution.

Skills shortages

- Not as good a match between suppliers' skills and users' requirements.

Part of the lack of knowledge about the benefits of automation may be attributable to the lack of on-site engineering skills. This is particularly evident for food manufacturing companies, where there are usually fewer engineers and they often have to concentrate on daily production rather than thinking about new equipment.

Automation is often supplied via Systems Integrators [SI]. The interviews suggest that the UK SI are fewer in number, smaller and less industry skilled than their counterparts in Germany, for example. We found several cases where the customer said that the UK supplier did not have enough specific industry knowledge to provide a solution.

Structural problems

- More relaxed employment regime.
- The availability of immigrant labour, particularly in the food industry.
- The reduced size of the UK manufacturing activity has resulted in a well documented decline in skills.

These structural weaknesses are outside the scope of this study and are therefore not considered further.

5. Recommendations for the UK

Although the UK is a long way behind in the use of automation, when compared to the other countries, manufacturing in the UK has many strengths including reasonable productivity levels achieved by the widespread assimilation of lean concepts. If the use of automation can be increased, UK manufacturing has the potential to be a significant force in global markets.

To address the barriers identified by the study and to provide an environment in which UK manufacturing will not only increase its usage of automation, but start to close the gap with our competitors, there is a need for an overall strategy to be coordinated and driven at a national level.

It is recommended that an Automation Council is formed to provide focus and deliver a strategy consisting of:

- A programme to raise awareness.
- Initiatives to encourage uptake by reducing risk.
- Strengthening of the skills base.

Automation Council

Rationale:

This study has demonstrated the need to increase UK activity in automation. This cannot be addressed by a single initiative. There needs to be an on-going programme to build UK expertise and activity over a number of years. This would be best addressed by a strategic initiative.

One of the major problems in terms of raising the awareness of automation is that it impacts across all sectors from energy generation via engineering and food to health care. There are therefore activities and interested parties working across many sectors and at different stages of automation maturity from research in the academic community through to fully proven production systems in manufacturing.

Although the Automation Study has focused on manufacturing, the benefit to the UK would be optimised by the implementation of a strategic approach. The objective would be to maximise the benefit and output by ensuring all automation initiatives were coordinated and to make it easier for information to be passed between sectors.

It is therefore proposed to create an Automation Council to meet these needs.

Purpose:

To provide high profile leadership to promote automation throughout all aspects of UK activity and to assist cross sector fertilisation and dissemination, by providing a focal point for, and signposting to, all UK automation activities.

To stimulate investment and activities related to automation throughout UK manufacturing and research and development.

To support various government departments and bodies (including BIS, Defra, TSB, EPSRC) providing advice and assistance, to ensure activities are coordinated and provide best value for money.

Operation:

The Council is to be made up of high profile representatives from each of the major sectors, with interest in and knowledge of automation within their sector, as well as banking and academia. It is hoped Government would also be represented.

The Automation Council would have a website, managed by others, to provide a focal point and signposting for all UK automation activities. This would also provide the follow up mechanism to support the anticipated awareness programmes undertaken by the Council.

The Council would meet four times per year, with the objective of implementing and coordinating tactical initiatives. These would be carried out by working groups drawn from the relevant sectors. One of the meetings should be a high profile event, attended by a Minister, to review activities and progress.

Raising Awareness

The interviews in the UK show that many of the companies are not fully aware of the potential for increased quality, reduced cost and the other benefits that automation offers at all stages of production and subsequent despatch. Nor do they appear generally worried by their increasing lack of productivity compared with their potential overseas competitors.

There is a need for more specific focus by MAS or alternative influential bodies, on the benefits achieved by automation, its effect on the up-skilling of employees as well as the potential to compete more widely.

The study has identified very successful manufacturing companies, in conventional industries, which are creating their success in world markets by investing in automated processes and achieving:

- Increased competitiveness.
- Significant export growth.
- Energy savings.
- Waste reduction.

To tackle the awareness issue a series of case histories is being prepared as the centre of a promotional programme, to show the approach, the need and the benefit gained.

The banks are under pressure to increase their lending to small companies, but may not be aware of the potential benefits of automated processes. Other audiences for this awareness campaign include the academic planners, to alert them to the special need, the engineering institutions to persuade them to give higher priority in their Continuing Professional Development, the Knowledge Transfer Networks and Government, to alert the policy makers to the particular benefits which automation can bring to the competitiveness of UK industry.

The above case histories can be used by SMEs across these other situations, for example, to help persuade the banks and other funding sources of the potential benefits of automation and the advantage to be gained by their clients.

Initiatives to Encourage Uptake

Within the implementation of automation systems there are two aspects of risk which need to be managed and mitigated to achieve a successful result:

First,

- the installation does not meet expectations. This could result from many causes; the initial objectives were unachievable, the system may be too expensive to operate, too difficult to manage or even too disruptive to existing production.

This is often the result of lack of knowledge and unrealistic expectations at the start of the automation process.

Second,

- the financial justification constrains the investment (reducing content and increasing risk) or the funding body (internal or external) is not persuaded to see beyond the short term, refusing funding, and thereby threatening the future performance of the business.

This is often a combination of lack of knowledge of the benefits and lack of skills in making the case for investment coupled with the very short payback criteria often applied.

The study recommends that a resource of impartial, expert assistance is provided to assist companies in developing their automation solutions and the supporting business case.

The existing support bodies such as CenFRA and MAS have limitations and have not been tasked with providing national leadership and support for automation. It would be beneficial for a national body to be appointed to fulfil this role with access to the necessary expertise to provide the support required to the SMEs.

Each new automation project is a risk. The manufacturer abandons an old method for a new one. It appears that the manufacturer, often due to lack of knowledge, places as much risk as possible onto the supplier. The actual supplier is often the System Integrator, and these companies are often small. If the system does not work, the Systems Integrator may not have the resources to recover the situation.

Re-appraisal by the robot suppliers is indicated, of their supplier partnerships in the UK to strengthen the specific sector knowledge which automation equipment systems integrators can bring to SMEs, and to help share the risk.

Within the recommendation above the external advisors would also be working with the manufacturer to ensure the risk is both understood and minimised.

The more successful and the larger companies have the resources to seek out support in funding, both of investment and training, related to automation systems. The feedback from the interviews shows that this process of navigating routes to government support, are perceived to be complex and time consuming. Simplification of the process is already under way, and this should be continued as a priority.

More clarity is needed concerning the availability of Government support and how to access it for an SME.

Skills

Lack of skills, needed to successfully apply automation systems, are evident at three levels: the engineers working at SME level, the shop floor workforce, and the suppliers.

In the short term existing vehicles should be used to address the provision of support. This might include the development of capabilities in MAS, engagement of one or a number of the Knowledge Transfer Networks (KTN), with the support of the Technology Strategy Board (TSB), and other academic-commercial bridging initiatives such as the “Robotdalen” programme in Sweden designed to further the use of robotics into Swedish SME’s.

We recommend the “Robotdalen” programme be examined to determine if it would be beneficial to introduce a similar programme in UK, perhaps through an existing KTN.

In the longer term there is a need for enhanced, and relevant, engineering skills to be output from the universities, colleges and schools. This is the subject of significant national debate and therefore probably better covered by other studies. However, it is worthwhile emphasising the appeal of robotics.

Robotics is, and is perceived as, an exciting, stimulating and interesting area of technology that encompasses many forms of engineering (mechanical, production, electrical and electronic) as well as computing. It could be used as a vehicle, at all levels to stimulate interest in STEM subjects.